FORM PTO 1390 (REV 5-99) US DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. §371

ATTORNEY DOCKET NUMBER: 2001-1467A

U.S. APPLICATION NO. (if known, see 37 CFR 1.5): NEW 09/980597

International Application No.	International Filing Date	Priority Date Claimed
PCT/EP00/03723	April 26, 2000	June 4, 1999

Title of Invention
HYDRAULIC PRESS APPARATUS WITH IMPROVED CONTROL OF THE OLEO-DYNAMIC CIRCUIT THEREOF

Applicant(s) For DO/EO/US
Jader PAVANETTO

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. §371.

2. [] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. §371.

3. [X] This express request to begin national examination procedures (35 U.S.C. §371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. §371(b) and PCT Articles 22 and 39(1).

4. [X] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. [X] A copy of the International Application as filed (35 U.S.C. §371(c)(2))
   a. [] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [X] has been transmitted by the International Bureau. **ATTACHMENT A**
   c. [] is not required, as the application was filed in the United States Receiving Office (RO/US)

6. [X] A copy of the International Application in English (35 U.S.C. §371(c)(2)). **ATTACHMENT B**

7. [] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3)).
   a. [] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [] have been transmitted by the International Bureau.
   c. [] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [] have not been made and will not be made.

8. [] A translation of the amendments to the claims under PCT Article 19.

9. [X] An (executed) oath or declaration of the inventor(s) (35 U.S.C. §371(c)(4)). **ATTACHMENT C**

10. [] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. §371(c)(5)).

Items 11. to 14. below concern other document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98. **ATTACHMENT D**

12. [X] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. **ATTACHMENT E**

13. [X] A FIRST preliminary amendment. **ATTACHMENT F**

    [] A SECOND or SUBSEQUENT preliminary amendment.

14. [X] Other items or information: Notification of Transmittal of the International Preliminary Examination Report - **ATTACHMENT G**

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) NEW 09/980591	INTERNATIONAL APPLICATION NO. PCT/EP00/03723	ATTORNEY'S DOCKET NO. 2001-1467A

15. [X] The following fees are submitted	CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):		
Neither international preliminary examination fee nor international search fee paid to USPTO and International Search Report not prepared by the EPO or JPO $1040.00		
International Search Report has been prepared by the EPO or JPO ..... $ 890.00		
International preliminary examination fee not paid ot USPTO but international search paid to USPTO ..... $ 740.00		
International preliminary examination fee paid to USPTO but claims did not satisfy provisions of PCT Article 33(1)-(4) ..... $ 690.00		
International preliminary examination fee paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) ..... $ 100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$890.00	
Surcharge of $130.00 for furnishing the oath or declaration later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	32 -20 =	12	X $18.00	$216.00	
Independent Claims	1 -3 =		X $84.00	$	
Multiple dependent claim(s) (if applicable)			+ $280.00	$	
TOTAL OF ABOVE CALCULATIONS =				$1106.00	
[] Small Entity Status is hereby asserted. Above fees are reduced by 1/2.				$	
SUBTOTAL =				$1106.00	
Processing fee of $130.00 for furnishing the English translation later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$1106.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40 per property +				$40.00	
TOTAL FEES ENCLOSED =				$1146.00	
				Amount to be refunded	$
				Amount to be charged	$

a. [X] A check in the amount of $1146.00 to cover the above fees is enclosed. A duplicate copy of this form is enclosed.

b. [] Please charge my Deposit Account No. 23-0975 in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 23-0975.

THE COMMISSIONER IS AUTHORIZED TO CHARGE ANY DEFICIENCY IN THE FEES FOR THIS PAPER TO DEPOSIT ACCOUNT NO. 23-0975

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

19. CORRESPONDENCE ADDRESS

000513

PATENT TRADEMARK OFFICE

By _____
Nils E. Pedersen
Registration No. 33,145

WENDEROTH, LIND & PONACK, L.L.P
2033 "K" Street, N.W., Suite 800
Washington, D.C. 20006-1021
Phone:(202) 721-8200
Fax:(202) 721-8250

December 4, 2001

[CHECK NO. 47803]

[2001_1467A]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	
Jader PAVANETTO	:	**Attn: BOX PCT**
Serial No. NEW	:	**Docket No. 2001-1467A**
Filed December 4, 2001	:	

HYDRAULIC PRESS APPARATUS WITH IMPROVED CONTROL OF THE OLEO-DYNAMIC CIRCUIT THEREOF
[Corresponding to PCT/EP00/03723 Filed April 26, 2000]

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents,
Washington, DC 20231

Sir:

Prior to examination of the above-referenced U.S. patent application please amend the application as follows:

IN THE SPECIFICATION

Please amend the specification as follows:

Please replace the paragraph beginning at page 5, line 28, to line 32, with the following rewritten paragraph:

The next, ie. second phase (Figure 2) may be considered as an intermediate oil transfer phase. Hydraulic fluid keeps being let into the cylinder 3 from the conduit 5 and this causes the guide column, and the related plunger-type piston, to move further downwards, while the hydraulic fluid keeps flowing over as explained above.

IN THE CLAIMS

Please amend the claims as follows:

1. (Amended) Hydraulic press apparatus comprising:

a lower table (1) and an upper table (2) adapted to be driven with a vertical motion against said lower plate by means of appropriate motion and position control means (3, 4, 5, 6),

a hollow cylinder (7) provided under said lower plate and arranged with its axis extending vertically, said cylinder having its upper edge (8) applied in a tight-fitting manner against the lower surface (9) of said lower plate (1),

a guide column (10) connected on top to said upper plate and having its lower end portion forming the rod of a piston (13) adapted to slide within said hollow cylinder,

a hole (14) extending throughout said lower plate (1) and adapted to accommodate said vertically sliding guide column,

an aperture (15) provided in the side surface of said hollow cylinder (7) and adapted to enable the inner volume (16), located above said piston, to communicate with hydraulic means (17) adapted to apply a hydraulic pressure within said inner volume when said piston is in its lower position, characterized in that

said guide column is provided with an inner cylindrical cavity (18) having a vertical axis and filled with hydraulic fluid, said cylindrical cavity extending into said piston (13) and coming out of the latter at the lower end portion thereof,

there is provided a plunger-type piston adapted to slide within said inner cylindrical cavity, said piston being provided with an upper cylindrical portion (20) that has such a diameter as to be able to plug said inner cavity, and with a lower portion (21) that has a smaller diameter so as to prevent it from entering into contact with the walls of said inner cylindrical cavity (18),

there is provided a through-bore (22) adapted to enable said inner cylindrical cavity (18) to communicate with said inner volume (16) when said upper cylindrical portion (20) of said plunger-type piston is situated under the level of said through-bore.

4. (Amended) Hydraulic press apparatus according to claim 2, characterized in that:

said upper portion (20) of said plunger-type piston is connected to said lower portion (21) thereof by means of a frusto-conical connecting portion (40),

said inner cylindrical cavity (18) is provided inside with a frusto-conical crown-like ring (23) arranged in a position below said through-bore (22) and adapted to engage said frusto-conical connecting portion so as to prevent said plunger-type piston from further displacing downwards,

and the height of said upper portion (20) of said plunger-type piston is not smaller than the difference in height between the upper edge of said through-bore (22) and said crown-like ring (23), so as to be able to plug said through-bore when said plunger-type piston is located above and in contact with said crown-like ring (23).

5. (Amended) Hydraulic press apparatus according to claim 2, characterized in that the upper edge (30) of said upper portion of said plunger-type piston has a frusto-conical shape,

said inner cylindrical cavity (18) is provided inside with a second preferably frusto-conical crown-like ring (25) arranged in a position above said through-bore and adapted to engage said upper edge (30) of said upper portion when said guide column is in its lower position.

6. (Amended) Hydraulic press apparatus according to claim 3, characterized in that there is provided an elastic member (27) on the bottom wall (24) of the hollow cylinder (7), in such a position as to be able to fit between said lower portion (21) and said bottom wall (24).

7. (Amended) Hydraulic press apparatus according to claim 1, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

Please add the following new claims:

8. Hydraulic press apparatus according to claim 3, characterized in that:

said upper portion (20) of said plunger-type piston is connected to said lower portion (21) thereof by means of a frusto-conical connecting portion (40),

said inner cylindrical cavity (18) is provided inside with a frusto-conical crown-like ring (23) arranged in a position below said through-bore (22) and adapted to engage said frusto-conical connecting portion so as to prevent said plunger-type piston from further displacing downwards,

and the height of said upper portion (20) of said plunger-type piston is not smaller than the difference in height between the upper edge of said through-bore (22) and said crown-like ring (23), so as to be able to plug said through-bore when said plunger-type piston is located above and in contact with said crown-like ring (23).

9. Hydraulic press apparatus according to claim 3, characterized in that

the upper edge (30) of said upper portion of said plunger-type piston has a frusto-conical shape,

said inner cylindrical cavity (18) is provided inside with a second preferably frusto-conical crown-like ring (25) arranged in a position above said through-bore and adapted to engage said upper edge (30) of said upper portion when said guide column is in its lower position.

10. Hydraulic press apparatus according to claim 4, characterized in that

the upper edge (30) of said upper portion of said plunger-type piston has a frusto-conical shape,

said inner cylindrical cavity (18) is provided inside with a second preferably frusto-conical crown-like ring (25) arranged in a position above said through-bore and adapted to engage said upper edge (30) of said upper portion when said guide column is in its lower position.

11. Hydraulic press apparatus according to claim 8, characterized in that

the upper edge (30) of said upper portion of said plunger-type piston has a frusto-conical shape,

said inner cylindrical cavity (18) is provided inside with a second preferably frusto-conical crown-like ring (25) arranged in a position above said through-bore and adapted to engage said upper edge (30) of said upper portion when said guide column is in its lower position.

12. Hydraulic press apparatus according to claim 4, characterized in that there is provided an elastic member (27) on the bottom wall (24) of the hollow cylinder (7), in such a position as to be able to fit between said lower portion (21) and said bottom wall (24).

13. Hydraulic press apparatus according to claim 8, characterized in that there is provided an elastic member (27) on the bottom wall (24) of the hollow cylinder (7), in such a position as to be able to fit between said lower portion (21) and said bottom wall (24).

14. Hydraulic press apparatus according to claim 5, characterized in that there is provided an elastic member (27) on the bottom wall (24) of the hollow cylinder (7), in such a position as to be able to fit between said lower portion (21) and said bottom wall (24).

15. Hydraulic press apparatus according to claim 9, characterized in that there is provided an elastic member (27) on the bottom wall (24) of the hollow cylinder (7), in such a position as to be able to fit between said lower portion (21) and said bottom wall (24).

16. Hydraulic press apparatus according to claim 10, characterized in that there is provided an elastic member (27) on the bottom wall (24) of the hollow cylinder (7), in such a position as to be able to fit between said lower portion (21) and said bottom wall (24).

17. Hydraulic press apparatus according to claim 11, characterized in that there is provided an elastic member (27) on the bottom wall (24) of the hollow cylinder (7), in such a position as to be able to fit between said lower portion (21) and said bottom wall (24).

18. Hydraulic press apparatus according to claim 2, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

19. Hydraulic press apparatus according to claim 3, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

20. Hydraulic press apparatus according to claim 4, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

21. Hydraulic press apparatus according to claim 8, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

22. Hydraulic press apparatus according to claim 5, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

23. Hydraulic press apparatus according to claim 9, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

24. Hydraulic press apparatus according to claim 10, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

25. Hydraulic press apparatus according to claim 11, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

26. Hydraulic press apparatus according to claim 6, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

27. Hydraulic press apparatus according to claim 12, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

28. Hydraulic press apparatus according to claim 13, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity

(18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

29. Hydraulic press apparatus according to claim 14, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

30. Hydraulic press apparatus according to claim 15, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

31. Hydraulic press apparatus according to claim 16, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

32. Hydraulic press apparatus according to claim 17, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

REMARKS

The above amendments have been made to make minor editorial changes so as to generally improve the form of the specification and the claim.

Furthermore, the present Preliminary Amendment is submitted to delete the multiple dependency of the claims, thereby placing such claims in condition for examination and reducing the required PTO filing fee.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current Preliminary Amendment. The attached page is captioned "**Version With Markings to Show Changes Made**".

Respectfully submitted,

Jader PAVANETTO

By _____

Nils E. Pedersen
Registration No. 33,145
Attorney for Applicant

NEP/krl
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
December 4, 2001

THE COMMISSIONER IS AUTHORIZED TO CHARGE [illegible] DEFICIENCY IN THE FEES FOR [illegible] OR CREDIT ANY OVERPAYMENT TO DEPOSIT ACCOUNT [illegible]

through-bore 22 open.

The operating mode, as anyone skilled in the art is at this point capable of realizing, is as follows:

- In a first phase (Figure 1), the guide column, and therefore also the therewith connected piston 13, is completely raised; hydraulic fluid at an appropriate pressure is let in from the conduit 5 of the cylinder 3 so as to cause the two plates 1 and 2 to move closer to each other; the floating piston is in a lowered position with respect to the through-bore 22 which, as a result, is left clear and open so as to enable the oil to flow over from the inner cylindrical cavity 18, whose volume is decreasing gradually owing to the upper plate being so caused to move downwards, to the inner volume 16 of the cylinder 7.

The floating piston does not fall back on to the bottom of the hollow cylinder 7, but is rather retained within said inner cylindrical cavity 18 by the action of an inner, preferably frusto-conical lower crown-like ring 23 which is arranged below said through-bore 22 and is adapted to stop said floating piston in a certain lower position thereof by interference with the upper cylindrical portion 20 thereof.

In an advantageous manner, also the lower edge 40 of said upper portion 20 is shaped in the form of a frustum of cone so as to be able to perfectly fit against the frusto-conical shape of said crown-like ring 23, while the combination of the position of said crown-like ring with the height of said upper portion of the floating piston is such that, when the latter is brought to rest on said crown-like ring, said through-bore remains clear and open.

- The next, ie. second phase (Figure 2) may be considered as an intermediate oil transfer phase. Hydraulic fluid keeps being let into the cylinder 3 from the conduit 5 and this causes the guide column, and the related plunger-type piston, to move further downwards, while the hydraulic fluid keeps flowing over as explained above.

CLAIMS

1. Hydraulic press apparatus comprising:

- a lower table (1) and an upper table (2) adapted to be driven with a vertical motion against said lower plate by means of appropriate motion and position control means (3, 4, 5, 6),

- a hollow cylinder (7) provided under said lower plate and arranged with its axis extending vertically, said cylinder having its upper edge (8) applied in a tight-fitting manner against the lower surface (9) of said lower plate (1),

- a guide column (10) connected on top to said upper plate and having its lower end portion forming the rod of a piston (13) adapted to slide within said hollow cylinder,

- a hole (14) extending throughout said lower plate (1) and adapted to accommodate said vertically sliding guide column,

- an aperture (15) provided in the side surface of said hollow cylinder (7) and adapted to enable the inner volume (16), located above said piston, to communicate with appropriate hydraulic means (17) adapted to apply a hydraulic pressure within said inner volume when said piston is in its lower position, characterized in that

- said guide column is provided with an inner cylindrical cavity (18) having a vertical axis and filled with hydraulic fluid, said cylindrical cavity extending into said piston (13) and coming out of the latter at the lower end portion thereof,

- there is provided a plunger-type piston adapted to slide within said inner cylindrical cavity, said piston being provided with an upper cylindrical portion (20)

the source of hydraulic pressure

that has such a diameter as to be able to plug said inner cavity, and with a lower portion (21) that has a smaller diameter so as to prevent it from entering into contact with the walls of said inner cylindrical cavity (18),

- there is provided a through-bore (22) adapted to enable said inner cylindrical cavity (18) to communicate with said inner volume (16) when said upper cylindrical portion (20) of said plunger-type piston is situated under the level of said through-bore.

2. Hydraulic press apparatus according to claim 1, characterized in that the lengths of said two portions (20, 21) of said plunger-type piston are such that, when the piston is in its lower position, said upper cylindrical portion of said plunger-type piston is adapted to plug said through-bore (22), and when said piston is in its position corresponding to the position of greatest separation of said lower and upper plates from each other, said upper cylindrical portion of said plunger-type piston is positioned so as to at least partially clear, ie. open said through-bore.

3. Hydraulic press apparatus according to claim 2, characterized in that, when the piston is in its lower position, said lower portion (21) abuts with its lower edge against the bottom wall (24) of said hollow cylinder (7).

4. Hydraulic press apparatus according to claim 2 or 3, characterized in that:

- said upper portion (20) of said plunger-type piston is connected to said lower portion (21) thereof by means of a frusto-conical connecting portion (40),

- said inner cylindrical cavity (18) is provided inside with a frusto-conical crown-like ring (23) arranged in a position below said through-bore (22) and adapted to engage said frusto-conical connecting portion so as to prevent said plunger-type piston from further displacing downwards,

- and the height of said upper portion (20) of said plunger-type piston is not smaller than the difference in height between the upper edge of said through-bore (22) and said crown-like ring (23), so as to be able to plug said through-bore when said plunger-type piston is located above and in contact with said crown-like ring (23).

Claim 2

5. Hydraulic press apparatus according to any of the preceding claims 2 to 4 characterized in that

- the upper edge (30) of said upper portion of said plunger-type piston has a frusto-conical shape,

- said inner cylindrical cavity (18) is provided inside with a second preferably frusto-conical crown-like ring (25) arranged in a position above said through-bore and adapted to engage said upper edge (30) of said upper portion when said guide column is in its lower position.

Claim 3

6. Hydraulic press apparatus according to any of the preceding claims 3 to 5 characterized in that there is provided an elastic member (27) on the bottom wall (24) of the hollow cylinder (7), in such a position as to be able to fit between said lower portion (21) and said bottom wall (24).

Claim 1

7. Hydraulic press apparatus according to any of the preceding claims characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

12/pro

HYDRAULIC PRESS APPARATUS WITH IMPROVED CONTROL OF THE OLEO-DYNAMIC CIRCUIT THEREOF

DESCRIPTION

The present invention refers to a vertical hydraulic press apparatus adapted to most efficiently and effectively cause complementary half-moulds to clamp together in both processes used to form metal materials and, in particular, in processes aimed at injection-moulding and forming thermoplastic materials.

A very wide variety and types of hydraulic press apparatuses are largely known to be currently available and in practical use. Anyway, it can be easily noticed that the simplicity in the overall construction of such machines and an as easy and effective as possible control of the operations thereof are among the most common requirements that engineers tend to comply with when designing these presses.

The basic schematic layout of a hydraulic press apparatus used for clamping half-moulds in injection-moulding processes for forming thermoplastic materials generally includes a guide column associated to a piston adapted to slide within a hydraulic cylinder. When the upper half-mould is moved vertically with respect to the stationary lower half-mould, the hydraulic fluid that finds itself on a side of the piston is partially transferred, owing to the displacement of the piston itself, to the other side of the piston through an external circuit and at least a controlled valve.

The presence of such an external circuit, however, implies the installation of a number of mechanical component parts and further requires a lot of precision machining operations to be performed. Such a need, along with the requirement for said valve and the related control circuits to be so provided, makes the construction of such a press apparatus particularly complicated, expensive and demanding, and also quite delicate in its operation.

US-A-5 204 047 and US-A-5 302 108 are known to teach a method for making a particular type of hydraulic press apparatus using a support column for said pistons so as to minimize the overall space requirements of the press, wherein the peculiarity of this press apparatus lies in its being provided with a plurality of pistons associated to a stationary differential piston.

Although the main purpose of said patents is actually reached with such a solution, also the so obtained press apparatus, however, turns out as being too complicated and expensive in its construction and delicate in its operation, owing particularly to the really large number of hydraulic conduits that need to be closed and opened in a synchronized pattern.

It is therefore a main purpose of the present invention to provide a vertical hydraulic press apparatus, particularly adapted for use in connection with plastic moulding processes. which is compact, reliable in its operation, uses low-cost materials, construction requirements and component parts, and has a simple and reliable construction based on the use of readily available techniques.

Such a type of press apparatus is obtained and implemented with the features that are substantially described with particular reference to the appended claims.

Anyway, features and advantages of the present invention can more readily be understood from the description that is given below by way of non-limiting example with reference to the accompanying drawings, in which:

- Figures 1 through to 11 are schematical, vertical-section views of a press

apparatus according to the present invention, during as many successive operating phases thereof;

With reference to the above Figures, the press apparatus according to the present invention comprises:

- a lower plate 1 and an upper plate 2 on which appropriate moulds (not shown) are applied;

- an actuation apparatus connected to said two plates and comprising a cylinder 3, a piston 4 and two conduits 5 and 6 adapted to selectively pump hydraulic fluid into the two volumes of said cylinder that are delimited and separated from each other by said piston;

- a hollow cylinder 7 provided under said lower plate and arranged with its axis extending vertically, said cylinder having its upper edge 8 arranged so as to tightly fit against the lower surface 9 of said lower plate 1;

- a guide column 10 connected with an appropriate connection means 11 to said upper plate and forming with its lower end portion 12 the rod of a piston 13 adapted to slide within said hollow cylinder 7, so that the entire guide column is able to be driven to move vertically;

- a bore 14 extending throughout said lower plate and adapted to accommodate said vertically sliding guide column;

- an aperture 15 provided in the side surface of said hollow cylinder 7 and adapted to enable the inner volume 16, which is provided above said piston, to communicate with appropriate means 17 adapted to apply a hydraulic pressure into said inner volume 16 when said piston 13 is in its lower position.

Anyway, what has been just described above belongs to the state of the art and has only been reminded here for reasons of better understanding.

According to the present invention, said guide column is provided with an inner cylindrical cavity 18 having its axis extending parallelly to the direction of displacement of the column and opening at the lower end portion 19 of the same column.

Inside said cylindrical cavity 18 there is arranged a sliding piston of the plunger type, which is formed by an upper cylindrical portion 20 and a lower portion 21.

Said upper cylindrical portion is so sized as to be able to plug said inner cylindrical cavity 18, while anyway allowing said piston to slide; moreover, the lower portion 21 of the piston is so sized as to extend downwards by a definite level, which shall be explained in greater detail further on, with respect to the upper portion, and has a width that is smaller than the width of the upper portion itself so that said lower portion will in no case be able to interfere with or touch the inner wall of said inner cylindrical cavity 18.

The wall of said guide column is provided, above the level of the piston 13, with a through-bore 22 that enables said inner volume 16 to communicate with said cylindrical cavity 18. It shall of course be appreciated that such a circumstance occurs when said plunger-type piston is displaced away from said through-bore, and the height of the upper portion of said plunger-type piston is furthermore at least equal to the height of said through-bore 22, so that said plunger-type piston is capable, in definite positions thereof, of shutting said through-bore, thereby interrupting the connection between said inner volume 16 and said cylindrical cavity 18.

The dimensions of the various afore described members are such that, when the piston 13 and, as a result, also the guide column are displaced in their lower position, as this is illustrated in Figures 5 and 6, the upper portion of the plunger-type piston plugs said through-bore, and when the piston 13 raises to a sufficiently high position, as this is illustrated in Figures 1, 2 and 3, the floating piston remains in a lowered position by the action of gravity and, as a consequence, leaves said

through-bore 22 open.

The operating mode, as anyone skilled in the art is at this point capable of realizing, is as follows:

- In a first phase (Figure 1), the guide column, and therefore also the therewith connected piston 13, is completely raised; hydraulic fluid at an appropriate pressure is let in from the conduit 5 of the cylinder 3 so as to cause the two plates 1 and 2 to move closer to each other; the floating piston is in a lowered position with respect to the through-bore 22 which, as a result, is left clear and open so as to enable the oil to flow over from the inner cylindrical cavity 18, whose volume is decreasing gradually owing to the upper plate being so caused to move downwards, to the inner volume 16 of the cylinder 7.

The floating piston does not fall back on to the bottom of the hollow cylinder 7, but is rather retained within said inner cylindrical cavity 18 by the action of an inner, preferably frusto-conical lower crown-like ring 23 which is arranged below said through-bore 22 and is adapted to stop said floating piston in a certain lower position thereof by interference with the upper cylindrical portion 20 thereof.

In an advantageous manner, also the lower edge 40 of said upper portion 20 is shaped in the form of a frustum of cone so as to be able to perfectly fit against the frusto-conical shape of said crown-like ring 23, while the combination of the position of said crown-like ring with the height of said upper portion of the floating piston is such that, when the latter is brought to rest on said crown-like ring, said through-bore remains clear and open.

- The next, ie. second phase (Figure 2) may be considered as an intermediate oil transfer phase. Hydraulic fluid keeps being let into the piston 3 from the conduit 5 and this causes the guide column, and the related plunger-type piston, to move further downwards, while the hydraulic fluid keeps flowing over as explained above.

- In the third phase (Figure 3) the guide column keeps lowering until the lower surface of the lower portion 21 of the plunger-type piston enters into contact with the bottom wall 24 of the hollow cylinder 7.

- In the fourth phase (Figure 4) the guide column keeps moving downwards and, with it, also the through-bore 22 which therefore moves closer to the level of the plunger-type piston that is prevented from lowering any further by said bottom wall 24; said through-bore starts therefore to be plugged.

- In the fifth phase (Figure 5) the guide column keeps lowering down to its bottom dead point.

In this position, in which the mould (not shown) is fully clamped, the through-bore 22 moves exactly in front of the upper cylindrical portion 20 of the plunger-type piston, which therefore plugs it. As a result, any passage of hydraulic fluid towards the inner volume 16 ceases.

In order to prevent even the smallest amount of hydraulic fluid from being able to seep through said through-bore into the cylindrical cavity 18 in the next compression phase, there is provided a second annular, preferably frusto-conical crown 25 arranged above said through-bore 22 and adapted to stop said floating piston in a definite lower position thereof by interference with the related upper cylindrical portion 20.

In an advantageous manner, also the upper edge 30 of said upper portion 20 is shaped in the form of a frustum of cone so as to be able to perfectly fit against the frusto-conical shape of said upper crown-like ring 25, while the combination of the position of said upper crown-like ring with the dimensions and the position of said upper portion of the floating piston is such that, when the latter is moved to its top dead point, the mating frusto-conical shapes of the upper crown-like ring 25 and the upper portion of the floating piston being so brought to fit against each other actually prevents any hydraulic fluid from seeping through the through-bore 22.

Furthermore, in order to prevent abrupt shocks and excessive pressures between said mating frusto-conical shapes there is provided an elastic element 27 on the bottom wall 24 of the hollow cylinder 7, which the lower portion of the plunger-type piston comes to lie against and which is further capable of absorbing, ie. taking up any possible modest interference and/or excessive coupling pressure.

- The sixth phase of the operation (Figure 6) is the phase in which the maximum extent of compression of the hydraulic fluid is brought about in view of keeping the mould firmly clamped against the expanding pressure of the part being moulded, which in fact would tend to cause the same mould to open apart. This compression is brought about by means of per sè known means 17 that are adapted to most quickly set said inner volume 16 under a high pressure by acting on the hydraulic fluid through said aperture 15 in the wall of the cylinder 7.

In this phase, the floating piston and the guide column do not move, ie. they stand still.

- The next seventh phase (Figure 7) corresponds to the opposite sequence of the sixth phase above. In other words, the pressure generated by said means 17 is released, while the guide column and the floating piston do not move yet.

- In the next eighth phase (Figure 8) the hydraulic fluid starts to be pumped into the conduit 6 of the cylinder 3 and this causes the upper plate 2, and therefore also the guide column, to move again upwards and the pressure on the elastic means 27 to be released by the floating piston owing to the action of also said second upper circular crown 25 being lifte jointly with the guide column.

- In the ninth phase (Figure 9) the guide column keeps raising, while the lower crown-like ring 23 is raised until it enters into contact with the lower edge of the upper cylindrical portion of the floating piston, however without causing the latter to start moving upwards yet. The through-bore 22 is opened as a result of the guide column being so raised, and the hydraulic fluid within the inner volume 16 is pushed and starts to flow over into said inner cylindrical cavity 18.

- In the tenth phase (Figure 10) the guide column still keeps raising so as to cause also the floating piston to rise by pulling it upwards owing to its having so engaged the inner lower crown-like ring 23; the hydraulic fluid keeps flowing over into the inner cylindrical cavity 18.

- In the last, ie. eleventh phase (Figure 11), the press regains a set-up which is similar to the one illustrated in Figure 1: the guide column and the upper plate reach the top dead center under a maximum extent of hydraulic fluid having been caused to flow over by this time. From this moment on, a new cycle can therefore start from the afore cited first phase.

Furthermore, in all Figures 1 through to 11 there can be noticed the presence of a cylindrical member 33 arranged in the form of a plug over the level of the hydraulic fluid in the cylindrical cavity 18. This cylindrical member 33 has the task of preventing any excessive surface vorticity, in particular during the phases in which the through-bore 22 is opened and closed; in view of promoting such a function, the volume of gas 34 above said cylindrical member is kept under a slight pneumatic pressure, preferably through an appropriate conduit 35.

The advantages of the present invention are now quite apparent and may be summarized as follows:

- smaller space taken up by the press apparatus owing to the maximum extent of efficiency in using the inner volumes of the guide column;

- maximum extent of construction and functional simplicity deriving from the elimination of any external hydraulic circuits;

- elimination of the controlled valves, under significant economic advantages deriving also from the elimination of the related control and actuation circuits.

Moreover, a press apparatus according to the present invention can be

implemented with the use of materials and techniques that are readily available and fully known in the art, which furthermore show no criticity or difficulty in their utilization.

It shall be appreciated that the description and illustrations given above with reference to the accompanying drawings have been given by mere way of exemplification of the present invention, and that a number of variants and modifications can therefore introduced thereto without departing from the scope of the present invention.

CLAIMS

1. Hydraulic press apparatus comprising:

- a lower table (1) and an upper table (2) adapted to be driven with a vertical motion against said lower plate by means of appropriate motion and position control means (3, 4, 5, 6),

- a hollow cylinder (7) provided under said lower plate and arranged with its axis extending vertically, said cylinder having its upper edge (8) applied in a tight-fitting manner against the lower surface (9) of said lower plate (1),

- a guide column (10) connected on top to said upper plate and having its lower end portion forming the rod of a piston (13) adapted to slide within said hollow cylinder,

- a hole (14) extending throughout said lower plate (1) and adapted to accommodate said vertically sliding guide column,

- an aperture (15) provided in the side surface of said hollow cylinder (7) and adapted to enable the inner volume (16), located above said piston, to communicate with appropriate means (17) adapted to apply a hydraulic pressure within said inner volume when said piston is in its lower position, characterized in that

- said guide column is provided with an inner cylindrical cavity (18) having a vertical axis and filled with hydraulic fluid, said cylindrical cavity extending into said piston (13) and coming out of the latter at the lower end portion thereof,

- there is provided a plunger-type piston adapted to slide within said inner cylindrical cavity, said piston being provided with an upper cylindrical portion (20)

a source of hydraulic pressure

that has such a diameter as to be able to plug said inner cavity, and with a lower portion (21) that has a smaller diameter so as to prevent it from entering into contact with the walls of said inner cylindrical cavity (18),

- there is provided a through-bore (22) adapted to enable said inner cylindrical cavity (18) to communicate with said inner volume (16) when said upper cylindrical portion (20) of said plunger-type piston is situated under the level of said through-bore.

2. Hydraulic press apparatus according to claim 1, characterized in that the lengths of said two portions (20, 21) of said plunger-type piston are such that, when the piston is in its lower position, said upper cylindrical portion of said plunger-type piston is adapted to plug said through-bore (22), and when said piston is in its position corresponding to the position of greatest separation of said lower and upper plates from each other, said upper cylindrical portion of said plunger-type piston is positioned so as to at least partially clear, ie. open said through-bore.

3. Hydraulic press apparatus according to claim 2, characterized in that, when the piston is in its lower position, said lower portion (21) abuts with its lower edge against the bottom wall (24) of said hollow cylinder (7).

4. Hydraulic press apparatus according to claim 2 or 3, characterized in that:

- said upper portion (20) of said plunger-type piston is connected to said lower portion (21) thereof by means of a frusto-conical connecting portion (40),

- said inner cylindrical cavity (18) is provided inside with a frusto-conical crown-like ring (23) arranged in a position below said through-bore (22) and adapted to engage said frusto-conical connecting portion so as to prevent said plunger-type piston from further displacing downwards,

- and the height of said upper portion (20) of said plunger-type piston is not smaller than the difference in height between the upper edge of said through-bore (22) and said crown-like ring (23), so as to be able to plug said through-bore when said plunger-type piston is located above and in contact with said crown-like ring (23).

5. Hydraulic press apparatus according to any of the preceding claims 2 to 4, characterized in that

- the upper edge (30) of said upper portion of said plunger-type piston has a frusto-conical shape,

- said inner cylindrical cavity (18) is provided inside with a second preferably frusto-conical crown-like ring (25) arranged in a position above said through-bore and adapted to engage said upper edge (30) of said upper portion when said guide column is in its lower position.

6. Hydraulic press apparatus according to any of the preceding claims 3 to 5, characterized in that there is provided an elastic member (27) on the bottom wall (24) of the hollow cylinder (7), in such a position as to be able to fit between said lower portion (21) and said bottom wall (24).

7. Hydraulic press apparatus according to any of the preceding claims, characterized in that there is provided a cylindrical member (33) above the level of the hydraulic fluid in said cylindrical cavity (18), and that the volume (34) of gas above said cylindrical member is put under pressure preferably through an external conduit (35).

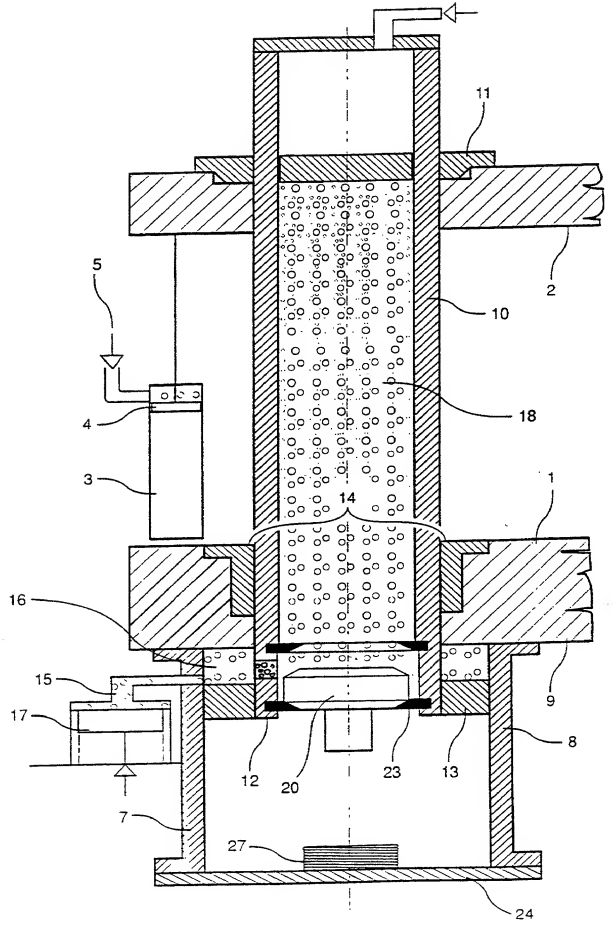

Fig.1

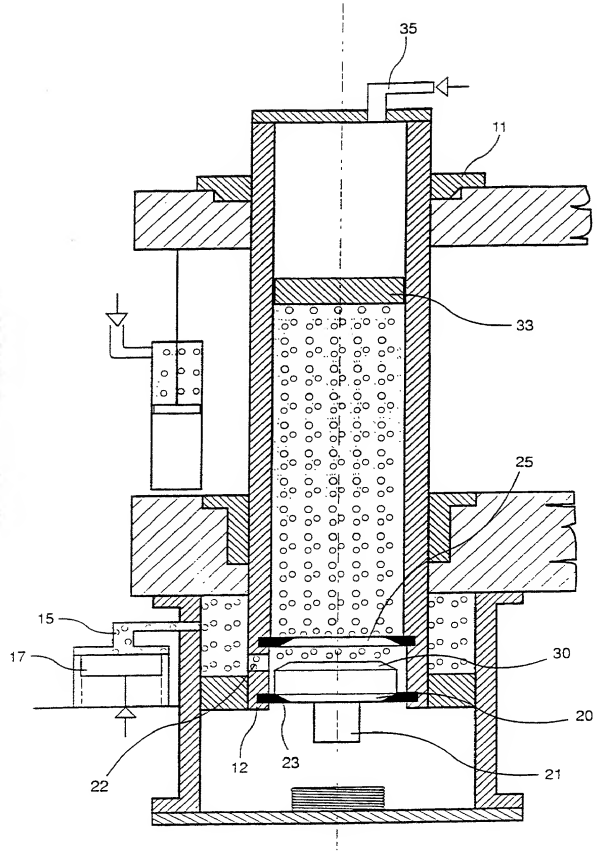

Fig. 2

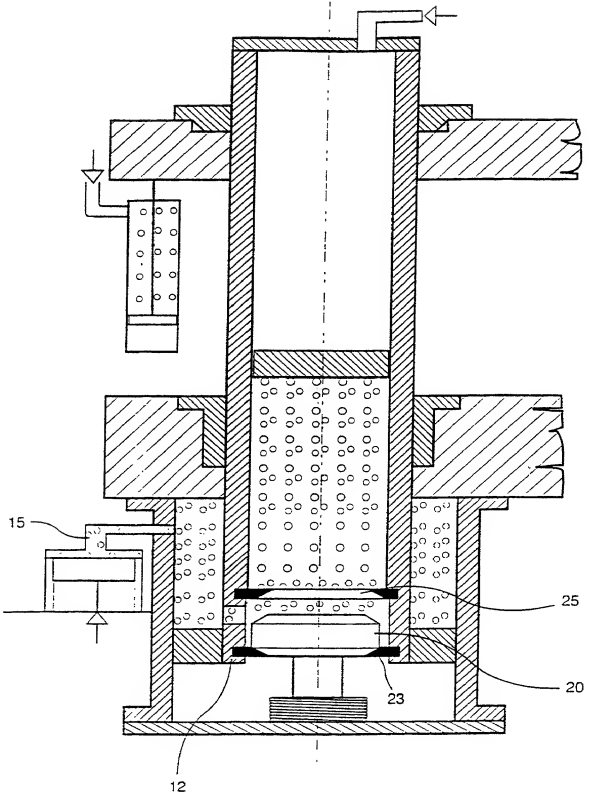

Fig. 3

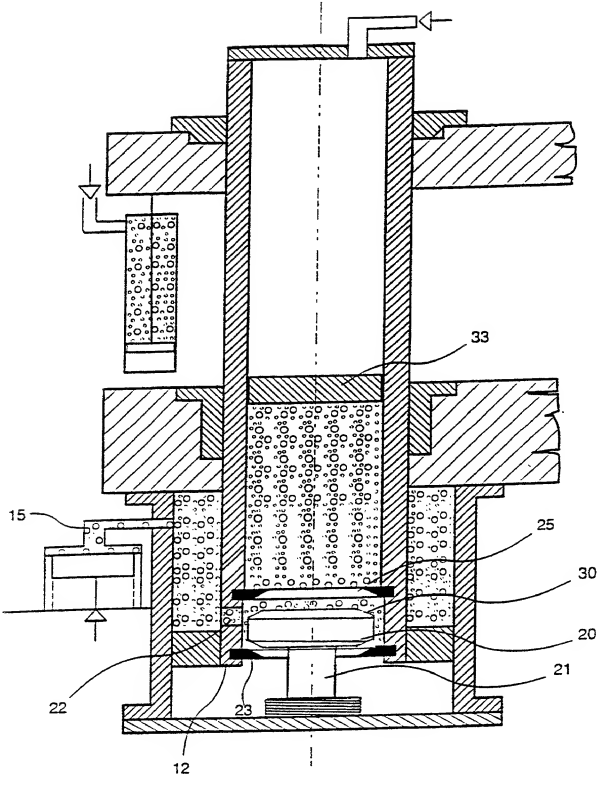

Fig. 4

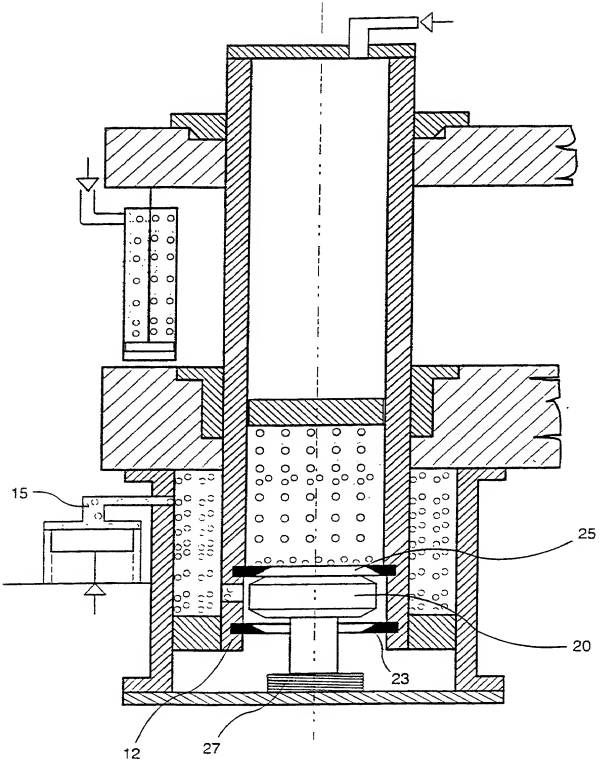

Fig. 5

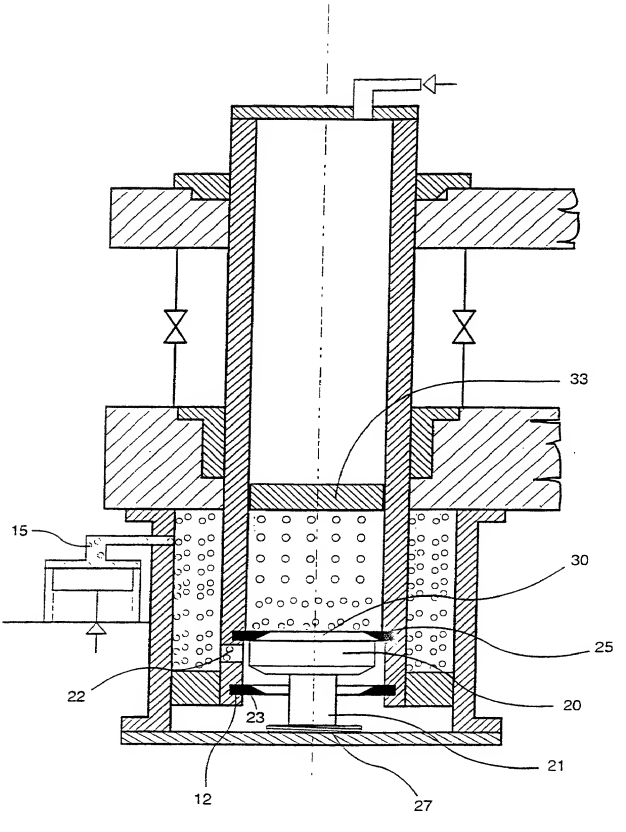

Fig. 6

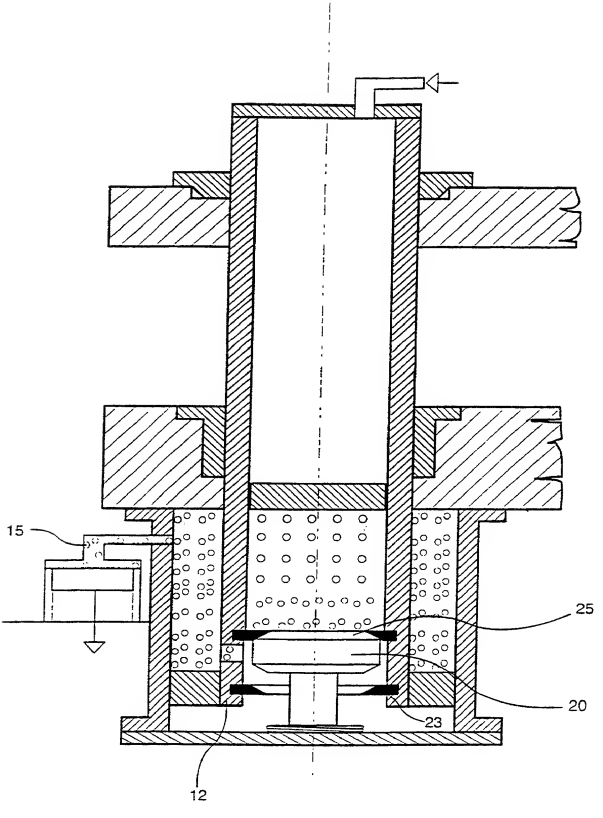

Fig. 7

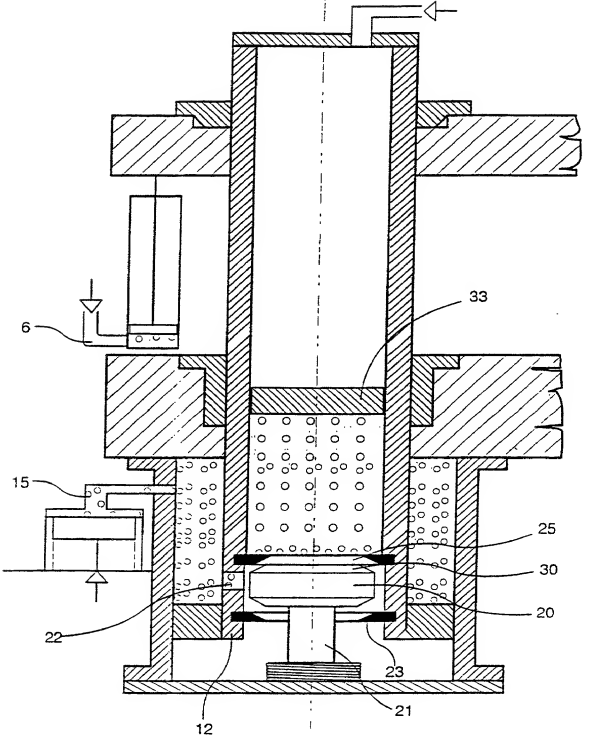

Fig. 8

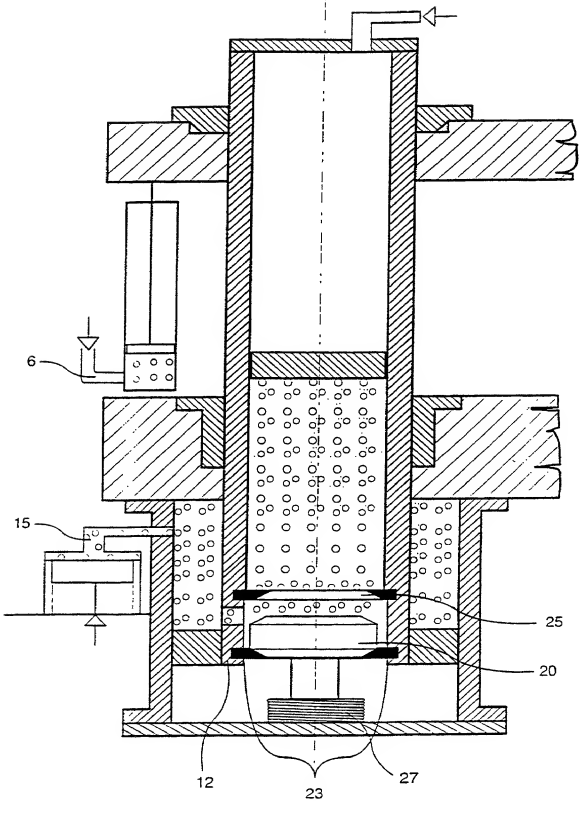

Fig. 9

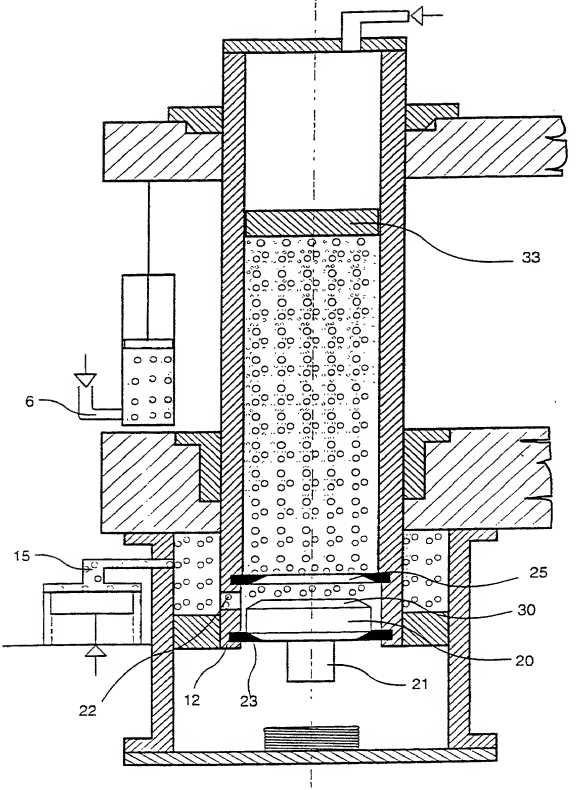

Fig. 10

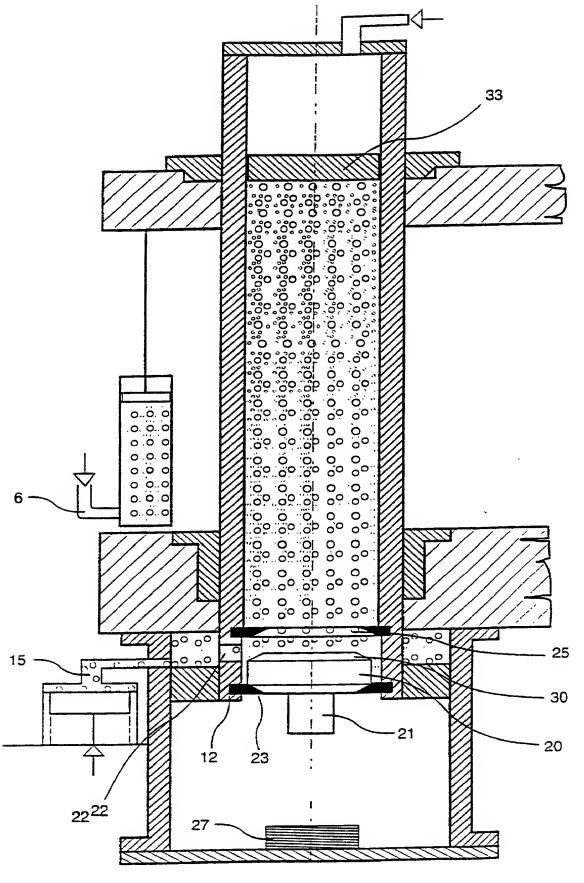

Fig. 11

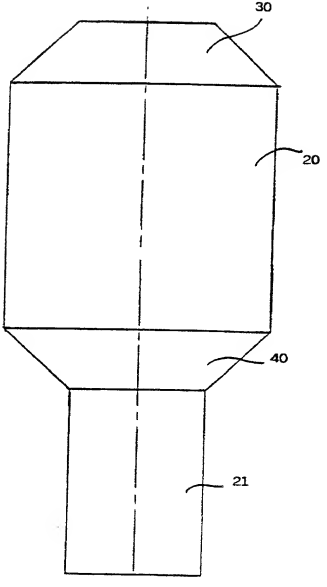

FIG. 12

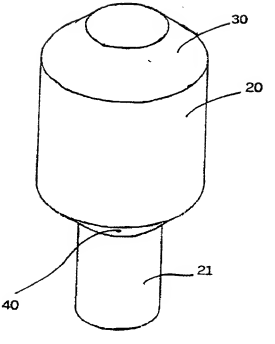

FIG. 12A

Rev. 3-21-01

Effective March 1998

DECLARATION AND POWER OF ATTORNEY FOR U.S. PATENT APPLICATION

() Original () Supplemental () Substitute (X) PCT () DESIGN

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Title: HYDRAULIC PRESS APPARATUS WITH IMPROVED CONTROL OF THE OLEO-DYNAMIC CIRCUIT THEREOF

of which is described and claimed in:
() the attached specification, or
() the specification in application Serial No. _____, filed _____, and with amendments through _____, or
(X) the specification in International Application No. PCT/EP00/03723, filed April 26, 2000, and as amended on (if applicable).

I hereby state that I have reviewed and understand the content of the above-identified specification, including the claims, as amended by any amendment(s) referred to above.

I acknowledge my duty to disclose to the Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim priority benefits under Title 35, United States Code, §119 (and §172 if this application is for a Design) of any application(s) for patent or inventor's certificate listed below and have also identified below any application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NO.	DATE OF FILING	PRIORITY CLAIMED
Italy	PN99A000047	June 4, 1999	YES

I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION SERIAL NO.	U.S. FILING DATE	STATUS: PATENTED, PENDING, ABANDONED

And I hereby appoint Michael R. Davis, Reg. No. 25,134; Matthew M. Jacob, Reg. No. 25,154; Warren M. Cheek, Jr., Reg. No. 33,367; Nils Pedersen, Reg. No. 33,145; Charles R. Watts, Reg. No. 33,142; and Michael S. Huppert, Reg. No. 40,268, who together constitute the firm of WENDEROTH, LIND & PONACK, L.L.P., as well as any other attorneys and agents associated with Customer No. 000513, to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected therewith.

I hereby authorize the U.S. attorneys and agents named herein to accept and follow instructions from Propria S.r.l. as to any action to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. attorneys and myself. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys named herein will be so notified by me.

Direct Correspondence to Customer No:	Direct Telephone Calls to:
000513 PATENT TRADEMARK OFFICE	WENDEROTH, LIND & PONACK, L.L.P. 2033 "K" Street, N.W., Suite 800 Washington, D.C. 20006-1021 Phone:(202) 721-8200 Fax:(202) 721-8250

Full Name of First Inventor	FAMILY NAME PAVANETTO	FIRST GIVEN NAME Jader	SECOND GIVEN NAME	
Residence & Citizenship	CITY Mestre	STATE OR COUNTRY ITX Italy	COUNTRY OF CITIZENSHIP Italy	
Post Office Address	ADDRESS Via Isonzo, 10, I-30174 Mestre, Italy	CITY	STATE OR COUNTRY	ZIP CODE

Full Name of Second Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP	
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE

Full Name of Third Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP	
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE

Full Name of Fourth Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP	
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE

Full Name of Fifth Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP	
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE

Full Name of Sixth Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP	
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE

I further declare that all statements made herein of my own knowledge are true, and that all statements on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

1st Inventor _____ Date November 19, 2001
Jader PAVANETTO

2nd Inventor _____ Date _____

3rd Inventor _____ Date _____

4th Inventor _____ Date _____

5th Inventor _____ Date _____

6th Inventor _____ Date _____

The above application may be more particularly identified as follows:

U.S. Application Serial No. NEW Filing Date

Applicant Reference Number SIPA/99/192 Atty Docket No. 2001-1467A

Title of Invention HYDRAULIC PRESS APPARATUS WITH IMPROVED CONTROL OF THE OLEO-DYNAMIC CIRCUIT THEREOF